Material Safety Data Sheet

Urea, liquor

Section 1. Chemical product and company identification

Product name : Urea, liquor

Supplier : AIRGAS INC., on behalf of its subsidiaries
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

Synonym : Urea Solution, NOx reagent, Aqueous solutions of Urea (30%-70%)

MSDS # : 012024

Date of Preparation/ Revision : **10/28/2013.**

In case of emergency : 1-866-734-3438

Section 2. Hazards identification

Physical state : Liquid.

Emergency overview : CAUTION!

MAY CAUSE EYE AND SKIN IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

Moderately irritating to the eyes and skin. Avoid breathing vapor or mist. Avoid contact with eyes, skin and clothing. Contains material that may cause target organ damage, based on animal data. Wash thoroughly after handling.

Target organs : Contains material which may cause damage to the following organs: lungs, skin, eye, lens or cornea.

Potential acute health effects

Eyes : Moderately irritating to eyes.Liquid contact may irritate mildly. Mist contact may also irritate mildly. Contact with heated material may cause thermal burns.

Skin : Moderately irritating to the skin.
Repeated or prolonged contact may cause reddening, itching and inflammation.

Inhalation : In the unlikely event that mist is formed, respiratory tract irritation may occur.

Ingestion : No known significant effects or critical hazards. A single dose of 100 grams has reportedly caused mild symptoms of Central Nervous System depression e. g. drowsiness and slow reflexes.

Potential chronic health effects

Chronic effects : No potential chronic effects known. Urea is a naturally occurring chemical in the body. It is an end
product of protein metabolism and is excreted in the urine.

Target organs : Contains material which may cause damage to the following organs: lungs, skin, eye, lens or cornea.

Medical conditions aggravated by over-exposure : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (Section 11)

Section 3. Composition, Information on Ingredients

United States

Name	CAS number	% Volume	Exposure limits
urea	57-13-6	31 - 70	**AIHA WEEL (United States, 10/2011).** TWA: 10 mg/m³ 8 hours.
nitrogen	7727-37-9	23.6 - 36	Oxygen Depletion [Asphyxiant]
biuret	108-19-0	0.15 - 1	
ammonia, anhydrous	7664-41-7	0.02 - 0.7	**ACGIH TLV (United States, 6/2013).** STEL: 24 mg/m³ 15 minutes. STEL: 35 ppm 15 minutes. TWA: 17 mg/m³ 8 hours. TWA: 25 ppm 8 hours. **NIOSH REL (United States, 4/2013).** STEL: 27 mg/m³ 15 minutes. STEL: 35 ppm 15 minutes. TWA: 18 mg/m³ 10 hours. TWA: 25 ppm 10 hours. **OSHA PEL (United States, 2/2013).** TWA: 35 mg/m³ 8 hours. TWA: 50 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** STEL: 27 mg/m³ 15 minutes. STEL: 35 ppm 15 minutes.
Carbon dioxide	124-38-9	0.2 - 0.3	**ACGIH TLV (United States, 3/2012).** **Oxygen Depletion [Asphyxiant].** STEL: 54000 mg/m³ 15 minutes. STEL: 30000 ppm 15 minutes. TWA: 9000 mg/m³ 8 hours. TWA: 5000 ppm 8 hours. **NIOSH REL (United States, 1/2013).** STEL: 54000 mg/m³ 15 minutes. STEL: 30000 ppm 15 minutes. TWA: 9000 mg/m³ 10 hours. TWA: 5000 ppm 10 hours. **OSHA PEL (United States, 6/2010).** TWA: 9000 mg/m³ 8 hours. TWA: 5000 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** STEL: 54000 mg/m³ 15 minutes. STEL: 30000 ppm 15 minutes. TWA: 18000 mg/m³ 8 hours. TWA: 10000 ppm 8 hours.

Section 4. First aid measures

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Section 5. Fire-fighting measures

Flammability of the product : May be combustible at high temperature.

Not available.

Products of combustion : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
nitrogen oxides

Extinguishing media

Suitable : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : None known.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

In a fire or if heated, a pressure increase will occur and the container may burst.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. Reference should be made to appropriate monitoring standards. Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

Engineering measures : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Personal protection in case of a large spill : Full chemical-resistant suit and self-contained breathing apparatus should be worn only by trained and authorized persons.

Product name	Exposure limits
United States	
urea	**AIHA WEEL (United States, 10/2011).** TWA: 10 mg/m³ 8 hours.
nitrogen	Oxygen Depletion [Asphyxiant]
biuret	
ammonia, anhydrous	**ACGIH TLV (United States, 6/2013).** STEL: 24 mg/m³ 15 minutes. STEL: 35 ppm 15 minutes. TWA: 17 mg/m³ 8 hours. TWA: 25 ppm 8 hours. **NIOSH REL (United States, 4/2013).** STEL: 27 mg/m³ 15 minutes. STEL: 35 ppm 15 minutes. TWA: 18 mg/m³ 10 hours. TWA: 25 ppm 10 hours. **OSHA PEL (United States, 2/2013).** TWA: 35 mg/m³ 8 hours. TWA: 50 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** STEL: 27 mg/m³ 15 minutes. STEL: 35 ppm 15 minutes.
Carbon dioxide	**ACGIH TLV (United States, 3/2012). Oxygen Depletion [Asphyxiant].**

STEL: 54000 mg/m³ 15 minutes.
STEL: 30000 ppm 15 minutes.
TWA: 9000 mg/m³ 8 hours.
TWA: 5000 ppm 8 hours.

NIOSH REL (United States, 1/2013).
STEL: 54000 mg/m³ 15 minutes.
STEL: 30000 ppm 15 minutes.
TWA: 9000 mg/m³ 10 hours.
TWA: 5000 ppm 10 hours.

OSHA PEL (United States, 6/2010).
TWA: 9000 mg/m³ 8 hours.
TWA: 5000 ppm 8 hours.

OSHA PEL 1989 (United States, 3/1989).
STEL: 54000 mg/m³ 15 minutes.
STEL: 30000 ppm 15 minutes.
TWA: 18000 mg/m³ 8 hours.
TWA: 10000 ppm 8 hours.

Section 9. Physical and chemical properties

Physical state : Liquid.

Color : Colorless.

Odor : mildly ammoniacal odor

pH : Typically 10.0 [7.2 (100 g/L)]

Boiling/condensation point : Boiling Point (50% urea solution):106ºC

Melting/freezing point : Salt Out Temperature:
50% @ 63ºF 17ºC
65% @ 115ºF 46ºC
70% @ 135ºF 57ºC

Specific gravity : 50%: 1.14 @ 75OF
65%: 1.165 @ 135OF
70%: 1.175 @ 155OF
32.5%: 1.090 @ 68oF 20oC

Vapor density : Not available

VOC : 0 % (w/w)

Physical/chemical properties comments : *Foliar - pH 7-8, Density 9.7 lbs/gallon @ 75ºF, Specific Gravity 1.16 @ 75º/60ºF prepared by neutralizing alkalinity in Urea 50 using Sulfuric Acid.

Section 10. Stability and reactivity

Stability and reactivity : The product is stable.

Incompatibility with various substances : Avoid contact with strong oxidizers (e.g. chlorine, peroxide, chromates, nitric acid, perchlorates,
concentrated oxygen, and permanganates) which can generate heat, fire or explosions or release toxic
fumes.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced. If the evaporation residue is heated to the melting point or above, Ammonia and Carbon Dioxide are
formed. Some Ammonia and CO2 are given off on heating the aqueous product. Under some conditions
of pressure and temperature, some Ammonium Cyanate has also been reported.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Product/ingredient name	Result	Species	Dose	Exposure
urea	LD50 Intraperitoneal	Rat	>5 g/kg	-
	LD50 Intratracheal	Rat	567 mg/kg	-
	LD50 Intravenous	Rat	5300 mg/kg	-
	LD50 Oral	Rat	8471 mg/kg	-
	LD50 Subcutaneous	Rat	8200 mg/kg	-
	TDLo Oral	Rat	750 mg/kg	-
ammonia, anhydrous	TDLo Oral	Rat	0.095 g/kg	-
	LC50 Inhalation Vapor	Rat	18600 mg/m³	5 minutes
	LC50 Inhalation Vapor	Rat	7040 mg/m³	30 minutes
	LC50 Inhalation Gas.	Rat	17401 ppm	15 minutes
	LC50 Inhalation Gas.	Rat	9500 ppm	1 hours
	LC50 Inhalation Gas.	Rat	7338 ppm	1 hours
Carbon dioxide	LC50 Inhalation Gas.	Rat	470000 ppm	30 minutes

Chronic effects on humans : Contains material which may cause damage to the following organs: lungs, skin, eye, lens or cornea.

Other toxic effects on humans : Hazardous by the following route of exposure: of skin contact (irritant).

Specific effects

Carcinogenic effects : No known significant effects or critical hazards.

Mutagenic effects : No known significant effects or critical hazards.

Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

urea	-	Acute EC50 6573.1 to 7061 mg/l Fresh water	Crustaceans - Water flea - Ceriodaphnia dubia - Neonate - <24 hours	48 hours
	-	Acute EC50 6573.1 mg/l Fresh water	Crustaceans - Water flea - Ceriodaphnia dubia - Neonate - <24 hours	48 hours
	-	Acute EC50 3910000 µg/l Fresh water	Daphnia - Water flea - Daphnia magna - Neonate - <24 hours	48 hours
	-	Acute LC50 >1000 mg/l Marine water	Crustaceans - Amphipod - Chaetogammarus marinus - Young - 5 mm	48 hours
	-	Acute LC50 22.5 ppt Fresh water	Fish - Mozambique tilapia - Oreochromis mossambicus - Young - 4.5 to 6 g	96 hours
	-	Acute LC50 64700 to	Fish - Rohu -	96 hours

Urea, liquor				
		69200 µg/l Fresh water	Labeo rohita - Egg	
	-	Acute LC50 23400 to 26500 µg/l Fresh water	Fish - Rohu - Labeo rohita - Egg	96 hours
	-	Acute LC50 16700 to 19600 µg/l Fresh water	Fish - Rohu - Labeo rohita - Egg	96 hours
	-	Acute LC50 5000 µg/l Fresh water	Fish - Giant gourami - Colisa fasciata - Fingerling	96 hours
ammonia, anhydrous	-	Acute EC50 29.2 mg/l Marine water	Algae - Sea Lettuce - Ulva fasciata - Zoea	96 hours
	US EPA	Acute EC50 131 ppm Fresh water	Daphnia - Water flea - Daphnia magna - <24 hours	48 hours
	-	Acute LC50 0.53 ppm Fresh water	Daphnia - Water flea - Daphnia magna	48 hours
	-	Acute LC50 25400 µg/l Fresh water	Daphnia - Water flea - Daphnia magna	48 hours
	-	Acute LC50 5210 to 6040 µg/l Marine water	Crustaceans - Redtail prawn - Fenneropenaeus penicillatus - Zoea	48 hours
	-	Acute LC50 4980 to 9070 µg/l Marine water	Crustaceans - Kuruma shrimp - Penaeus japonicus - Nauplii - 3 to 5 stage	48 hours
	-	Acute LC50 4180 to 6030 µg/l Fresh water	Daphnia - Water flea - Daphnia magna - <24 hours	48 hours
	-	Acute LC50 4130 to 5100 µg/l Fresh water	Daphnia - Water flea - Daphnia pulex - <24 hours	48 hours
	-	Acute LC50 2710 to 3670 µg/l Fresh water	Crustaceans - Water flea - Ceriodaphnia reticulata - <4 hours	48 hours
	-	Acute LC50 2500 µg/l Fresh water	Crustaceans - Aquatic sowbug - Asellus aquaticus - 8 to 10 mm	48 hours
	-	Acute LC50 2080 µg/l Fresh water	Crustaceans - Scud - Gammarus pulex - 8 to 12 mm	48 hours
	-	Acute LC50 660 µg/l Fresh water	Fish - common carp - Cyprinus carpio	96 hours
	-	Acute LC50 450 to 470 µg/l Fresh water	Fish - Chinook salmon - Oncorhynchus tshawytscha - Underyearling - 1	96 hours

Urea, liquor				
			to 7 g	
	-	Acute LC50 440 µg/l Fresh water	Fish - common carp - Cyprinus carpio	96 hours
	-	Acute LC50 380 µg/l Fresh water	Fish - Silver carp - Hypophthalmichthys molitrix - Fingerling	96 hours
	-	Acute LC50 300 µg/l Fresh water	Fish - Carp - Hypophthalmichthys nobilis	96 hours
	-	Chronic NOEC 1 mg/l Fresh water	Algae - Diatom - Skeletonema costatum	3 days
	-	Chronic NOEC 0.204 mg/l Marine water	Fish - Sea bass - Dicentrarchus labrax - 131.3 g	62 days
	-	Chronic NOEC 550 µg/l Fresh water	Fish - Roach - Rutilus rutilus - Embryo - 6 hours	31 days

Products of degradation : Products of degradation: carbon oxides (CO, CO_2) and water, nitrogen oxides (NO, NO_2 etc.).

Section 13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation.Return cylinders with residual product to Airgas, Inc.Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	Not regulated.	-	-	-		**Reportable quantity** 14285.7 lbs / 6485.7 kg Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.

Urea, liquor						
TDG Classification	Not regulated.	-	-	-		-
Mexico Classification	Not regulated.	-	-	-		**Reportable quantity** 14285.7 lbs / 6485.7 kg Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Section 15. Regulatory information

United States

HCS Classification : Irritating material
Target organ effects

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined
United States inventory (TSCA 8b): All components are listed or exempted.

SARA 302/304: ammonia, anhydrous
SARA 311/312 Hazards identification: Immediate (acute) health hazard, Delayed (chronic) health hazard

Clean Water Act (CWA) 311: ammonia, anhydrous

State regulations : **Connecticut Carcinogen Reporting**: None of the components are listed.
Connecticut Hazardous Material Survey: None of the components are listed.
Florida substances: None of the components are listed.
Illinois Chemical Safety Act: None of the components are listed.
Illinois Toxic Substances Disclosure to Employee Act: None of the components are listed.
Louisiana Reporting: None of the components are listed.
Louisiana Spill: None of the components are listed.
Massachusetts Spill: None of the components are listed.
Massachusetts Substances: The following components are listed: NITROGEN
Michigan Critical Material: None of the components are listed.
Minnesota Hazardous Substances: None of the components are listed.
New Jersey Hazardous Substances: The following components are listed: NITROGEN
New Jersey Spill: None of the components are listed.
New Jersey Toxic Catastrophe Prevention Act: None of the components are listed.
New York Acutely Hazardous Substances: None of the components are listed.
New York Toxic Chemical Release Reporting: None of the components are listed.
Pennsylvania RTK Hazardous Substances: The following components are listed: NITROGEN
Rhode Island Hazardous Substances: None of the components are listed.

Canada

WHMIS (Canada) : Not controlled under WHMIS (Canada).

CEPA Toxic substances: None of the components are listed.
Canadian ARET: None of the components are listed.
Canadian NPRI: None of the components are listed.
Alberta Designated Substances: None of the components are listed.
Ontario Designated Substances: None of the components are listed.
Quebec Designated Substances: None of the components are listed.

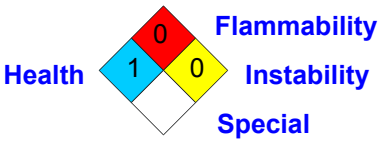
Section 16. Other information

Label requirements : MAY CAUSE EYE AND SKIN IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

Hazardous Material Information System (U.S.A.) :

Health	*	1
Flammability		0
Physical hazards		0

National Fire Protection Association (U.S.A.) :



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.